भारतीय मानक

Indian Standard

IS 8008 : 2022

[*Amalgamating* IS 8008 (Parts 1 to 9)]

जल आपूर्ति के लिए अन्तः क्षेपण संचकित/मशीनीकृत पॉलीइथाईलिन फिटिंग — विशिष्टि

(दूसरा पुनरीक्षण)

Injection Moulded/Machined Polyethylene Fittings for Water Supply — Specification

(Second Revision)

ICS 23.040.45, 91.140.60, 93.025

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Plastic Piping System Sectional Committee, CED 50

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastic Piping System Sectional Committee had been approved by the Civil Engineering Division Council.

This standard covers requirements for injection moulded/machined polyethylene (PE) fittings which are used for connection by butt fusion welding process to PE pipes covered by IS 4984 : 2016 'Polyethylene pipes for water supply — Specification' (*fifth revision*).

Fabricated PE fittings are covered in IS 8360 : 2022 'Fabricated polyethylene fittings for water supplies — Specification (*first revision*).

This standard was first published in 1976 as a single standard and subsequently revised in 2003 in 9 parts as given below keeping in view the developments in this field and to align the various requirements as per those covered in revised IS 4984:1995 'High density polyethylene pipes for water supply — Specification (*fourth revision*)' for high density polyethylene pipes:

IS 8008 Injection moulded/machined high density polyethylene (HDPE) fittings for potable water supplies — Specification:

Part 1 : 2003 General requirements for fittings (*first revision*)
Part 2 : 2003 Specific requirements for 90° bends (*first revision*)
Part 3 : 2003 Specific requirements for 90° tees (*first revision*)
Part 4 : 2003 Specific requirements for reducers (*first revision*)
Part 5 : 2003 Specific requirements for ferrule reducers (*first revision*)
Part 6 : 2003 Specific requirements for pipe ends (*first revision*)
Part 7 : 2003 Specific requirements for sandwich flanges (*first revision*)
Part 8 : 2003 Specific requirements for reducing tees (*first revision*)
Part 9 : 2003 Specific requirements for end caps (*first revision*)

The general requirements for materials, manufacture, methods of test and inspection and marking of all types of injection moulded and machined PE fittings were covered in the first part and remaining parts covered specific requirements of different types of fittings like for 90° bends, 90° tees, etc.

This revision of the standard has been brought out to align the requirements relating to material, dimensional requirements, some performance requirements, testing procedures and sampling methodology as per the revised IS 4984 : 2016 'Polyethylene pipes for water supply — Specification (*fifth revision*)'. Further, in this revision of the standard, it has been decided to amalgamate all the parts for ease of reference, as also as per the corresponding International (ISO) Standard.

In this revision of the standard, the following major modifications have been incorporated:

a) As polyethylene fittings are designated by their minimum required strength (MRS), the earlier nomenclature of high density polyethylene fittings has been renamed as polyethylene fittings. Further, the standard now covers fittings for all water supplies including potable water supply. Accordingly, the title of the standard has been modified;
b) Requirements of raw material including PE resin have been modified in line with IS 4984;
c) As per IS 4984, wall thicknesses have been specified based on standard dimension ratios (SDR);
d) The maximum permitted addition of rework material has been reduced from 10 percent to 5 percent considering that with advanced mechanized manufacturing process, the wastage has now come to the order of 5 percent;
e) Requirements for melt flow rate (MFR), density, oxidation induction time and overall migration of the fittings have been added;

(*Continued on third cover*)

Indian Standard

INJECTION MOULDED/MACHINED POLYETHYLENE FITTINGS FOR WATER SUPPLY — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard covers requirements for materials, manufacture, dimensions, methods of test and inspection and marking of all types of injection moulded and machined polyethylene (PE) fittings intended for connection to PE pipes covered by IS 4984 for water supplies.

NOTE — Fittings from 20 mm to 315 mm are generally manufactured by the injection moulding methods and machined, wherever so required; and fittings of 355 mm and above are manufactured from thick walled extruded pipes or compression moulded slabs or extrusion flow moulding and then machined to desired dimensions.

1.2 For technical reasons, the fittings may be welded to pipes of same pressure rating. Deviations from this requirement are allowed if the wall thicknesses are equal in the welding zone.

1.3 The fittings covered in this standard are intended to be used under the following conditions of water supplies:

a) A maximum operating pressure of 2.0 MPa (20 bar); and

b) An operating temperature of 27 °C as the reference temperature.

1.3.1 For applications operating at constant temperatures other than 27 °C and between the range 20 °C to 45 °C, maximum allowable operating pressure shall be calculated in accordance with **1.4**, Table 1 and Fig. 1 of IS 4984.

2 REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subjected to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compounds
4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
4984 : 2016	Polyethylene pipes for water supply — Specification (*fifth revision*)
7328 : 2020	Specification for polyethylene material for moulding and extrusion (*second revision*)
9845 : 1998	Determination of overall migration of constituents of plastics materials and articles intended to come in contact with foodstuffs — Method of analysis (*second revision*)
10146 : 1982	Specification for polyethylene for its safe use in contact with foodstuff, pharmaceuticals and drinking water
14885 : 2021	Polyethylene pipe for supply of gaseous fuel — Specification (*first revision)*
16738 : 2018	Positive list of constituents for polypropylene, polyethylene and their copolymers for its safe use in contact with foodstuffs and pharmaceuticals

3 TERMINOLOGY

For the purpose of this standard, the terms and definitions as given in IS 4984 shall apply.

4 MATERIAL

4.1 Fittings shall be classified according to the grade of the raw material (resin) as given in Table 1 of IS 4984. The resin supplier shall give the raw material grade.

4.2 The material used for the manufacture of fittings should not constitute toxic hazard, should not support microbial growth and should not give rise to unpleasant taste or odour, cloudiness or discoloration of water. Fittings manufacturers shall obtain a certificate to this effect from the manufacturer of raw material. The raw material for the manufacture of fittings shall meet the requirements specified in **5** of IS 4984.

4.3 Rework Material

The addition of not more than 5 percent of the manufacturer's own rework material resulting from the manufacture of fittings conforming to this standard is permissible. No other rework material shall be used.

5 COLOUR

The color of the fittings shall be black.

6 SIZES AND DESIGNATION OF FITTINGS

6.1 The nominal outside diameter of the fittings at the free ends covered in this standard are 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 180, 200, 225, 250, 280, 315, 355, 400, 450, 500, 560, 630, 710, 800, 900, 1 000,1 200,1 400,1 600, 2 000, 2 250 and 2 500 mm.

6.2 Bends, tees, pipe ends and end caps shall be designated by their nominal outside diameter, *D*, at the free ends and grade of material. Reducers and ferrule reducers shall be designated by the nominal diameter at major free end, D_1 and minor nominal diameter at minor free end, D_2, as $D_1 \times D_2$ along with grade of material. Reducing tees shall be designated by the nominal diameter equal free ends, *D* and nominal diameter at reduced free end d as $D \times$ d along with grade of material. Sandwich flanges shall be designated by the nominal, outside diameter of their respective pipes, *D* along with grade of material. The outside diameters at the free ends of the fittings shall correspond to the outside diameters of the pipes given in IS 4984.

7 WELD LENGTHS (WHEREVER APPLICABLE)

Since 3 to 5 mm length goes in welding, it is difficult to re-weld the bend, tee, if any weld gets rejected. Hence, a minimum weld length of 15 mm is specified to make provision for re-welding and to avoid wastage of whole fitting due to shortage of weld length.

8 VISUAL APPEARANCE

When viewed without magnification, the internal and external surface of the fitting shall be smooth, clean and free from scoring, cavities and other surface defects to an extent that would prevent conformity to this standard. The weld line and parting line should not be prominent so as to affect the hydraulic performance of fitting.

9 DIMENSIONS OF FITTINGS

9.1 The mean outside diameters, d_{em}, and the corresponding minimum and maximum wall thicknesses of the fittings at the free ends for weld, when measured in accordance with **7.4.1.1** of IS 4984 shall be as given in Table 3 and Table 4 of IS 4984.

9.2 The out-of-roundness (ovality) of the fittings for different nominal diameters covered in the standard when measured in accordance with **7.4.1.2** of IS 4984 shall be as given in Table 3 of IS 4984.

9.3 The laying length, welding length and tolerances thereon for different types of fittings shall be in accordance with **9.3.1** to **9.3.8**.

9.3.1 *90° Bends*

90° bends of sizes 20 mm to 315 mm are covered in the standard. A typical illustration of 90° bend is shown in Fig. 1. The laying length, welding length and tolerances thereon for 90° bends shall be as given in Table 1 read with Fig. 1.

9.3.2 *90° Tees*

90° tees of sizes 20 mm to 315 mm are covered in the standard. A typical illustration of 90° tee is shown in Fig. 2. The laying length, welding length and tolerances thereon for 90° tees shall be as given in Table 2 read with Fig. 2.

9.3.3 *Reducers*

Reducers of sizes 20 mm to 1 400 mm are covered in the standard. A typical illustration of reducer is shown in Fig. 3. The laying lengths, welding length and tolerances thereon for reducers shall be as given in Table 3 read with Fig. 3.

9.3.4 *Ferrule Reducers*

Ferrule reducers of sizes 32 mm to 630 mm are covered in the standard. A typical illustration of reducer is shown in Fig. 4. The laying lengths, welding length and tolerances thereon for ferrule reducers shall be as given in Table 4 read with Fig. 4.

9.3.5 *Pipe Ends*

Pipe ends of sizes 16 mm to 2 000 mm are covered in the standard. A typical illustration of pipe end is shown in Fig. 5. The laying lengths, welding length, collar height, collar diameter and tolerances thereon for pipe ends shall be as given in Table 5 read with Fig. 5.

9.3.6 *Sandwich Flanges*

Sandwich flanges of sizes 16 mm to 2 000 mm are covered in the standard. A typical illustration of sandwich flange is shown in Fig. 6. The nominal flange size, pipe outside diameter, flange inside diameter, pitch circle diameter of flange, flange outside diameter, thickness of flange, thickness of mild steel insert, diameter of hole, number of holes and tolerances thereon for pipe ends shall be as given in Table 6 read with Fig. 6.

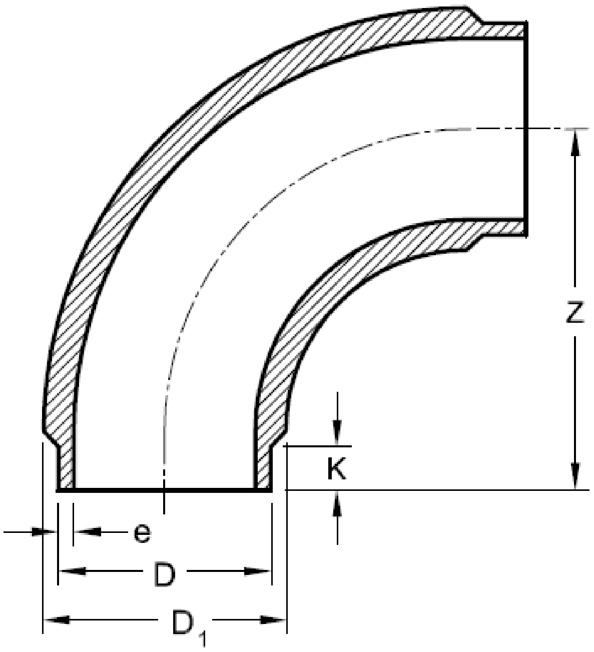


FIG. 1 90° BEND

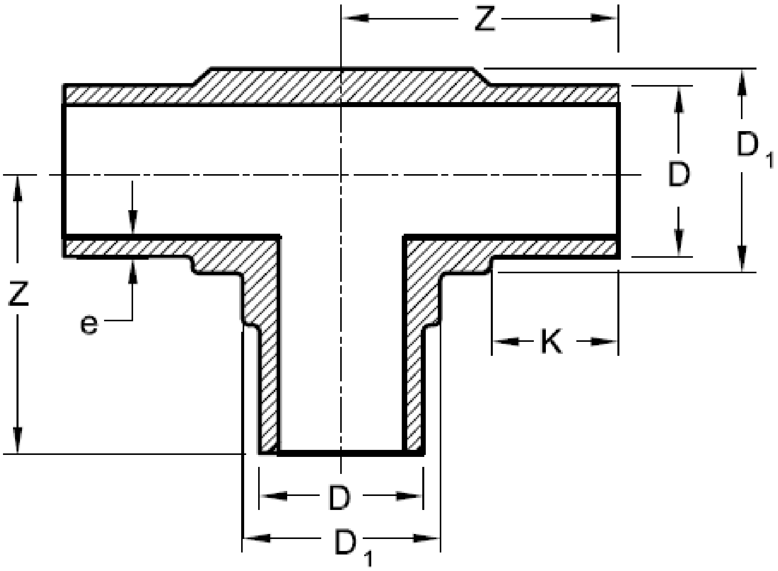
Table 1 Dimensions for 90° Bends

(*Clause* 9.3.1)

All dimensions in millimetres.

Sl No.	Nominal Outside Diameter, *D*	Diameter for Manufacturing Reference, D_1	Welding Length, *K*, *Min*	Laying Length, *Z*
(1)	(2)	(3)	(4)	(5)
i)	20	27	15	35 ± 1
ii)	25	29	15	40 ± 2
iii)	32	36.5	15	50 ± 2
iv)	40	46.5	15	60 ± 2
v)	50	57	15	70 ± 2
vi)	63	70.5	15	80 ± 2
vii)	75	85	15	90 ± 2
viii)	90	98	15	110 ± 2
ix)	110	122	15	140 ± 3
x)	125	135	15	140 ± 3
xi)	140	150	15	150 ± 3
xii)	160	170	15	170 ± 3
xiii)	180	195	15	195 ± 3
xiv)	200	215	15	215 ± 4
xv)	225	245	15	245 ± 4
xvi)	250	260	15	260 ± 4
xvii)	280	290	15	290 ± 4
xviii)	315	325	15	325 ± 4

[1] Tolerance on diameter for manufacturing reference, D_1 shall be ± 3 mm.



NOTE — e is the wall thickness corresponding to IS 4984.

FIG. 2 90° TEE

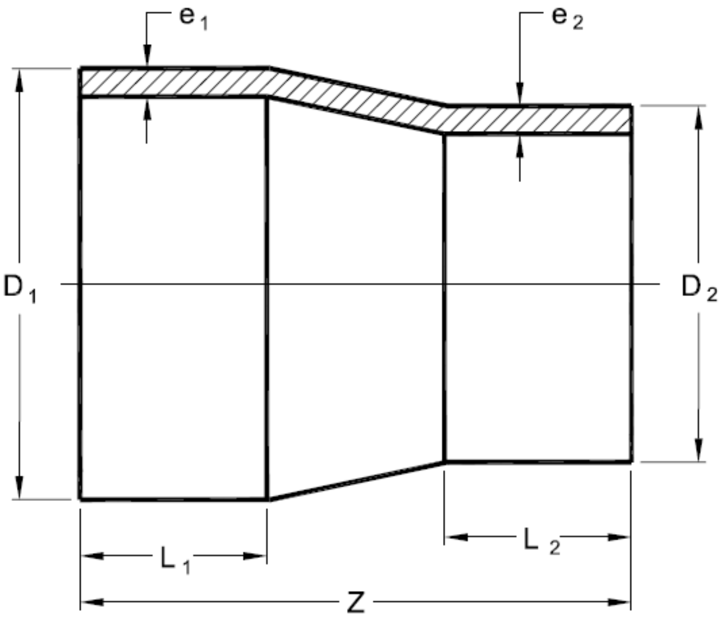
Table 2 Dimensions for 90° Tee

(*Clause* 9.3.2)

All dimensions in millimetres.

Sl No.	Nominal Diameter, *D*	Diameter for Manufacturing Reference, D_1[1)]	Welding Length, *K, Min*	Laying Length, *Z*
(1)	(2)	(3)	(4)	(5)
i)	20	27	15	36.5 ± 1
ii)	25	29	15	39 ± 2
iii)	32	36.5	15	46 ± 2
iv)	40	46.5	15	63 ± 2
v)	50	57	15	75 ± 2
vi)	63	70.5	15	80 ± 2
vii)	75	85	15	88 ± 2
viii)	90	98	15	98.5 ± 2
ix)	110	122	15	122.5 ± 3
x)	125	135	15	135 ± 3
xi)	140	150	15	145 ± 3
xii)	160	170	15	157 ± 3
xiii)	180	195	15	195 ± 3
xiv)	200	215	15	215 ± 4
xv)	225	245	15	245 ± 4
xvi)	250	260	15	260 ± 4
xvii)	280	290	15	290 ± 4
xviii)	315	325	15	315 ± 4

[1)] Tolerance on diameter for manufacturing reference, D_1 shall be ± 3 mm.



NOTE — e_1 and e_2 are the wall thicknesses corresponding to IS 4984.

FIG. 3 REDUCER

Table 3 Dimensions for Reducers

(*Clause* 9.3.3)

All dimensions in millimetres.

Sl No.	Major Diameter, D_1	Minor Diameter, D_2	L_1	L_2	Laying Length, *Z*
(1)	(2)	(3)	(4)	(5)	(6)
i)	25	20	18	15	50
ii)	32	20	18	15	50
iii)	32	25	18	15	50
iv)	40	20	18	15	60
v)	40	25	18	15	60
vi)	40	32	18	15	60
vii)	50	25	18	15	65
viii)	50	32	18	15	65
ix)	50	40	18	15	65
x)	63	32	18	15	70
xi)	63	40	18	15	70
xii)	63	50	18	15	70
xiii)	75	40	19	15	70
xiv)	75	50	19	15	70
xv)	75	63	19	16	70
xvi)	90	50	24	15	80

Table 3 (*Continued*)

Sl No. (1)	Major Diameter, D_1 (2)	Minor Diameter, D_2 (3)	L_1 (4)	L_2 (5)	Laying Length, Z (6)
xvii)	90	63	24	16	80
xviii)	90	75	24	21	80
xix)	110	50	30	18	130
xx)	110	63	30	18	95
xxi)	110	75	30	21	95
xxii)	110	90	30	24	95
xxiii)	125	63	34	18	137
xxiv)	125	75	34	21	105
xxv)	125	90	34	24	105
xxvi)	125	110	34	30	105
xxvii)	140	75	37	20	146
xxviii)	140	90	37	24	115
xxix)	140	110	37	30	115
xxx)	140	125	37	34	115
xxxi)	160	90	42	24	162
xxxii)	160	110	42	30	125
xxxiii)	160	125	42	34	125
xxxiv)	160	140	42	37	125
xxxv)	180	110	47	34	173
xxxvi)	180	125	47	34	135
xxxvii)	180	140	47	37	135
xxxviii)	180	160	47	42	135
xxxix)	200	110	52	30	206
xl)	200	125	52	34	189
xli)	200	140	52	37	140
xlii)	200	160	52	42	140
xliii)	200	180	52	47	140
xliv)	225	110	57	30	245
xlv)	225	125	57	34	228
xlvi)	225	160	57	42	165
xlvii)	225	180	57	47	165
xlviii)	225	200	57	52	165
xlix)	250	140	62	37	250
l)	250	160	62	42	228
li)	250	180	62	47	180
lii)	250	200	62	52	180
liii)	250	225	62	57	180
liv)	280	160	72	42	279
lv)	280	180	72	47	256
lvi)	280	200	72	52	205
lvii)	280	225	72	57	205
lviii)	280	250	72	62	205
lix)	315	160	82	42	337

Table 3 (*Continued*)

Sl No. (1)	Major Diameter, D_1 (2)	Minor Diameter, D_2 (3)	L_1 (4)	L_2 (5)	Laying Length, Z (6)
lx)	315	180	82	47	314
lxi)	315	200	82	52	292
lxii)	315	225	82	57	230
lxiii)	315	250	82	62	230
lxiv)	315	280	82	72	230
lxv)	355	200	90	52	355
lxvi)	355	225	90	57	325
lxvii)	355	250	90	62	296
lxviii)	355	280	90	72	265
lxix)	355	315	90	82	227
lxx)	400	200	90	52	417
lxxi)	400	280	90	72	327
lxxii)	400	315	90	82	289
lxiii)	400	355	90	90	242
lxxiv)	450	250	90	62	427
lxxv)	450	280	90	72	395
lxxvi)	450	315	90	82	357
lxxvii)	450	355	90	90	310
lxxviii)	450	400	90	90	249
lxxix)	500	315	90	82	426
lxxx)	500	355	90	90	379
lxxxi)	500	400	90	90	317
lxxxii)	500	450	90	90	249
lxxxiii)	560	225	120	57	637
lxxxiv)	560	315	120	82	538
lxxxv)	560	355	90	90	461
lxxxvi)	560	400	90	90	400
lxxxvii)	560	450	90	90	331
lxxxviii)	560	500	90	90	262
lxxxix)	630	400	120	90	526
xc)	630	450	120	90	457
xci)	630	500	120	90	388
xcii)	630	560	120	90	306
xciii)	710	450	120	90	567
xciv)	710	500	120	90	498
xcv)	710	560	120	90	416
xcvi)	710	630	120	120	350
xcvii)	800	450	120	90	690
xcviii)	800	500	120	90	622
xcix)	800	560	120	90	539
c)	800	630	120	120	473
ci)	800	710	120	120	364

Table 3 (*Concluded*)

Sl No. (1)	**Major Diameter, D_1** (2)	**Minor Diameter, D_2** (3)	**L_1** (4)	**L_2** (5)	**Laying Length, Z** (6)
cii)	900	500	120	90	759
ciii)	900	560	120	90	677
civ)	900	630	120	120	611
cv)	900	710	120	120	501
cvi)	900	800	120	120	377
cvii)	1 000	630	150	120	778
cviii)	1 000	710	150	120	668
cix)	1 000	800	150	120	545
cx)	1 000	900	150	120	407
cxi)	1 200	630	150	120	1 053
cxii)	1 200	710	150	120	943
cxiii)	1 200	800	150	120	819
cxiv)	1 200	900	150	120	682
cxv)	1 200	1 000	150	150	575
cxvi)	1 400	560	200	90	1 200
cxvii)	1 400	630	200	120	1 200
cxviii)	1 400	710	200	120	1 200
cxix)	1 400	800	200	120	1 100
cxx)	1 400	900	200	150	1 050
cxxi)	1 600	1 000	200	150	1 174
cxxii)	1 600	1 200	200	150	899
cxxiii)	1 600	1 400	200	200	675

Tolerances on various dimensions shall be as given below:

Dimensions	*Tolerances for D_1 less than 630 mm*	*Tolerances for D_1 including and above 630 mm*
L_1	± 10 mm	± 20 mm
L_2	± 10 mm	± 20 mm
Z	± 20 mm	± 50 mm

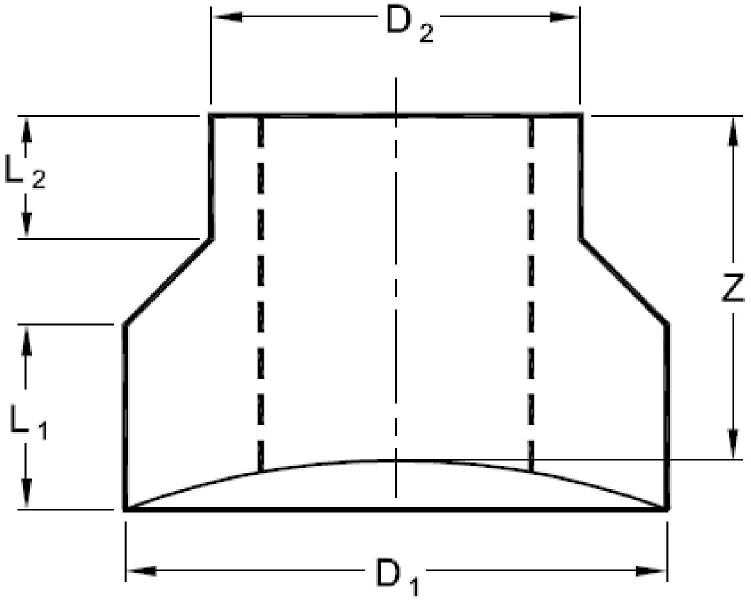


FIG. 4 FERRULE REDUCER

Table 4 Dimensions for Ferrule Reducers

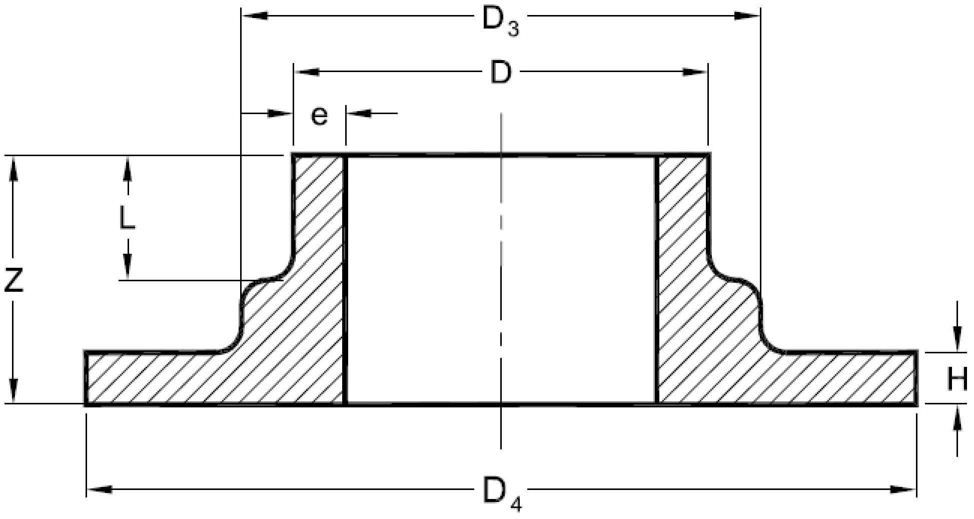
(*Clause* 9.3.4)

All dimensions in millimetres.

Sl No. (1)	Major Diameter, D_1 (2)	Minor Diameter, D_2 (3)	L_1 (4)	L_2 (5)	Laying Length, Z (6)
i)	32	63	18	18	48
ii)	90	63	24	18	74.3
iii)	110	63	30	18	89.4
iv)	160	63	42	18	98.5
v)	225	63	57	18	102.8
vi)	250	63	62	18	108.5
vii)	280	63	72	18	122.4
viii)	315	63	82	18	134.2
ix)	355	63	94	18	145.2
x)	400	63	108	18	155.3
xi)	450	63	120	18	162.4
xii)	500	63	132	18	170.8
xiii)	560	63	144	18	188.1
xiv)	630	63	162	18	204.4

Tolerance on various dimensions shall be as given below:

Dimensions	*Tolerances*
L_1	± 2 mm
L_2	± 3 mm
Z	± 2 mm



NOTE — *e* is the wall thickness corresponding to IS 4984.

FIG. 5 PIPE END

Table 5 Dimensions for Pipe Ends

(*Clause* 9.3.5)

All dimensions in millimetres.

SI No.	**Nominal Diameter, *D***	**Diameter for Manufacturing Reference, D_3**	**Collar Diameter, D_4**	**PN 4/PN 6**			**PN 8/PN 10**			**PN 12.5**			**PN 16**		
				Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*	Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*	Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*	Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
i)	20	28	47	50	7	–	50	7	28	52	9	28	54	11	28
ii)	25	34	57	50	9	28	50	9	24	52	11	24	56	15	24
iii)	32	40	67	50	10	27	50	10	27	53	13	27	56	16	27
iv)	40	49	78	50	11	24	50	11	24	53	14	24	57	18	24

Table 5 (*Continued*)

SI No.	**Nominal Diameter, *D***	**Diameter for Manufacturing Reference, D_3**	**Collar Diameter, D_4**	**PN 4/PN 6**			**PN 8/PN 10**			**PN 12.5**			**PN 16**		
				Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*	Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*	Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*	Laying Length, *Z*	Collar Height, *H*	Welding Length, *L*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
v)	50	60	80	50	12	23	50	12	23	53	15	23	57	19	23
vi)	63	72	94	50	14	16	50	14	16	54	18	16	59	23	16
vii)	75	84	105	50	16	14	50	16	14	54	20	14	60	26	14
viii)	90	99	125	80	17	43	80	17	43	84	21	43	90	27	43
ix)	110	119	158	80	18	37	80	18	37	85	23	37	91	29	37
x)	125	134	188	80	18	42	80	25	35	86	31	42	95	40	42
xi)	140	150	188	80	18	34	80	25	27	86	31	27	95	40	27
xii)	160	170	214	80	18	34	80	25	27	86	31	27	95	40	27
xiii)	180	190	214	80	20	30	80	30	20	87	37	20	98	48	20
xiv)	200	210	269	100	24	36	100	32	28	108	40	28	120	52	28
xv)	225	235	269	100	24	46	100	32	38	108	40	38	119	51	38
xvi)	250	261	320	100	25	35	100	35	25	109	44	25	120	55	25
xvii)	280	291	320	100	25	45	100	35	35	109	44	35	121	56	35
xviii)	315	327	370	100	25	35	100	35	25	109	44	25	121	56	25
xix)	355	373	430	120	30	50	120	40	40	130	50	40	148	68	40
xx)	400	427	482	120	33	42	120	46	29	131	57	29	154	80	29
xxi)	450	477	534	120	46	20	120	60	20	135	75	20	129	69	20
xxii)	500	530	585	120	46	24	120	60	20	135	75	20	137	77	20
xxiii)	560	615	670	120	50	20	120	60	20	135	75	20	146	86	20
xxiv)	630	642	685	120	50	30	120	60	20	135	75	20	157	97	20
xxv)	710	737	800	120	50	20	120	67	20	128	75	20	142	89	20
xxvi)	800	840	905	120	52	18	120	67	20	134	81	20	153	100	20
xxvii)	900	944	1 005	120	55	15	120	75	20	136	90	20	158	113	20
xxviii)	1 000	1 047	1 110	140	60	20	140	84	20	156	100	20	180	124	20

Table 5 (*Concluded*)

SI No.	Nominal Diameter, D	Diameter for Manufacturing Reference, D_3	Collar Diameter, D_4	PN 4/PN 6			PN 8/PN 10			PN 12.5			PN 16		
				Laying Length, Z	Collar Height, H	Welding Length, L	Laying Length, Z	Collar Height, H	Welding Length, L	Laying Length, Z	Collar Height, H	Welding Length, L	Laying Length, Z	Collar Height, H	Welding Length, L
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
xxix)	1 200	1 255	1 320	175	72	50	175	72	50	223	120	50	–	–	–
xxx)	1 400	1 440	1 525	214	74	80	214	74	80	282	142	80	–	–	–
xxxi)	1 600	1 645	1 750	200	80	70	200	80	70	280	160	70	–	–	–
xxxii)	1 800	1 860	1 960	297	135	162	–	–	–	–	–	–	–	–	–
xxxiii)	2 000	2 060	2 170	330	150	180	–	–	–	–	–	–	–	–	–
xxxiv)	2 250	2 320	2 434	372	172	200	–	–	–	–	–	–	–	–	–
xxxv)	2 500	2 550	2 730	471	187	225	–	–	–	–	–	–	–	–	–

Tolerances on various dimensions shall be as given below:

Dimensions	*Tolerances for Sizes up to 1 000 mm*	*Tolerances for Sizes including and above 1 000 mm*
Diameter for manufacturing reference, D_3	± 2 mm	± 5 mm
Collar diameter, D_4	± 2 mm	± 5 mm
Laying length, Z	± 2 mm	± 6 mm
Collar height, H	± 1 mm	± 3 mm
Welding length, L	± 1 mm	± 3 mm

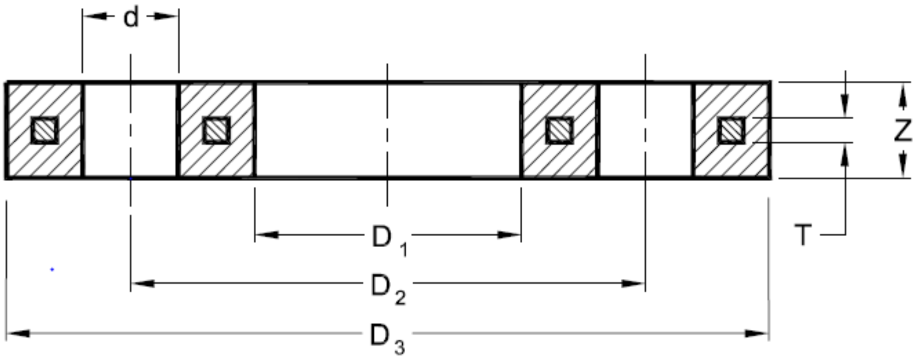


FIG. 6 SANDWICH FLANGE

Table 6 Dimensions for Sandwich Flanges

(*Clause* 9.3.6)

All dimensions in millimetres.

Sl No.	Nominal Flange Size	Pipe Outside Diameter, *D*	Flange Inside Diameter, D_1	Pitch Circle Diameter of Flange, D_2	Flange Outside Diameter, D_3	Thickness of Flange, *Z*	Thickness of Mild Steel Insert, *T*	Diameter of Hole, *d*	Number of Holes
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	16	20	32	65	95	20	6 ± 0.3	14	4
ii)	20	25	38	75	105	20	6 ± 0.3	14	4
iii)	25	32	44	85	115	20	6 ± 0.3	14	4
iv)	32	40	53	100	140	20	6 ± 0.3	18	4
v)	40	50	64	110	150	20	6 ± 0.3	18	4
vi)	50	63	76	125	165	20	6 ± 0.3	18	4
vii)	65	75	88	145	185	20	6 ± 0.3	18	4
viii)	80	90	103	160	200	20	9 ± 0.5	18	8
ix)	100	110	123	180	220	20	9 ± 0.5	18	8
x)	100	125	138	210	250	20	9 ± 0.5	18	8
xi)	125	140	154	210	250	20	9 ± 0.5	18	8
xii)	150	160	174	240	285	20	9 ± 0.5	22	8
xiii)	200	180	194	240	285	20	9 ± 0.5	22	8
xiv)	200	200	214	295	340	25	12 ± 0.5	22	8
xv)	200	225	239	295	340	25	12 ± 0.5	22	8
xvi)	250	250	265	350	395	30	16 ± 0.5	22	12
xvii)	250	280	295	350	395	30	16 ± 0.5	22	12
xviii)	300	315	331	400	445	30	19 ± 0.5	22	12
xix)	350	355	376	460	505	30	19 ± 0.5	22	16
xx)	400	400	430	515	565	35	22 ± 0.5	26	16
xxi)	500	450	517	620	670	35	22 ± 0.5	26	20
xxii)	500	500	533	620	670	35	22 ± 0.5	26	20
xxiii)	600	560	618	725	780	35	22 ± 0.5	30	20
xxiv)	600	630	645	725	780	35	22 ± 0.5	30	24
xxv)	700	710	745	840	895	40	25 ± 0.8	30	24
xxvi)	800	800	845	950	1 015	40	26 ± 0.8	34	24

Table 6 (*Concluded*)

Sl No. (1)	Nominal Flange Size (2)	Pipe Outside Diameter, *D* (3)	Flange Inside Diameter, D_1 (4)	Pitch Circle Diameter of Flange, D_2 (5)	Flange Outside Diameter, D_3 (6)	Thickness of Flange, *Z* (7)	Thickness of Mild Steel Insert, *T* (8)	Diameter of Hole, *d* (9)	Number of Holes (10)
xxvii)	900	900	946	1 050	1 115	45	29 ± 0.8	34	28
xxviii)	1 000	1 000	1 060	1 160	1 230	45	32 ± 1.0	36	28
xxix)	1 200	1 200	1 265	1 380	1 455	50	37 ± 1.0	40	32
xxx)	1 400	1 400	1 465	1 590	1 685	50	38 ± 1.0	42	36
xxxi)	1 600	1 600	1 655	1 710	1 800	50	41 ± 1.0	48	40
xxxii)	2 000	2 000	2 080	2 426	2 534	50	43 ± 1.0	48	46

Tolerances on various dimensions shall be as given below:

Dimension	*Tolerances*
Flange inside diameter, D_1	± 1 mm
Pitch circle diameter of flange, D_2	± 0.5 mm
Flange outside diameter, D_3	± 1 mm
Thickness of flange, *Z*	± 0.5 mm
Diameter of hole, *d*	± 0.5

9.3.7 *Reducing Tees*

Reducing tees of sizes 63 mm to 2 500 mm are covered in the standard. A typical illustration of reducing tee is shown in Fig. 7. The laying lengths and tolerances thereon for pipe ends shall be as given in Table 7 read with Fig. 7.

9.3.8 *End Caps*

9.3.8.1 *Injection moulded end caps*

Injection moulded end caps of sizes 20 mm to 250 mm are covered in the standard. A typical illustration of injection moulded end caps is shown in Fig. 8. The tubular length, laying length and tolerances thereon for end caps of various nominal diameters shall be as given in Table 8 read with Fig. 8.

9.3.8.2 *Machine moulded end caps*

Machine moulded end caps of sizes 20 mm to 2 500 mm are covered in the standard. A typical illustration of machine moulded end caps is shown in Fig. 9. The depth and total length, and tolerances thereon for pipe end caps shall be as given in Table 9 read with Fig. 9.

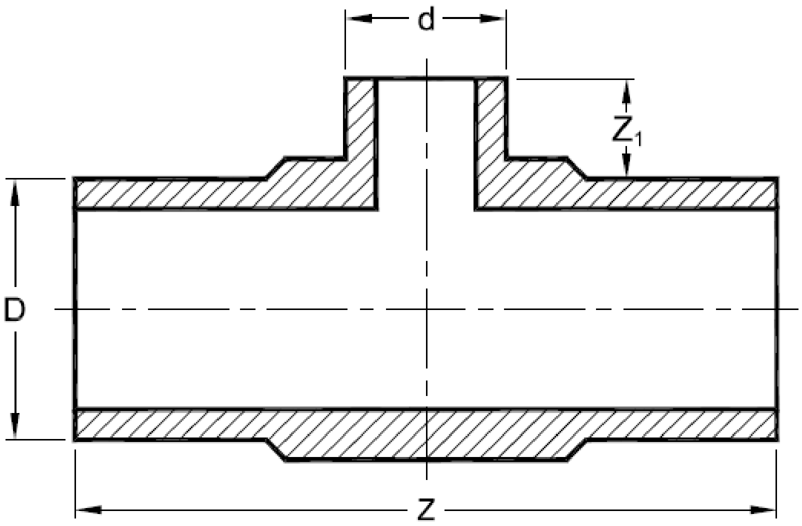


FIG. 7 REDUCING TEE

Table 7 Dimensions of Reducing Tee

(*Clause* 9.3.7)

All dimensions in millimetres.

Sl No.	**Size**		***Z***	***Z*₁**
	Nominal Diameter at Equal Ends, *D*	Nominal Diameter at Reduced Ends, *d*		
(1)	(2)	(3)	(4)	(5)
i)	63	50	230	77
ii)	63	40	230	72
iii)	63	32	230	67
iv)	75	63	264	88
v)	75	50	264	80
vi)	75	40	264	75
vii)	75	32	264	71
viii)	90	75	301	96
ix)	90	63	301	89
x)	90	50	301	81
xi)	110	90	330	105
xii)	110	75	330	96
xiii)	110	63	330	89
xiv)	110	50	330	81
xv)	125	110	366	114
xvi)	125	90	366	106
xvii)	140	125	380	113
xviii)	140	110	380	109

Table 7 (*Continued*)

Sl No.	Size		*Z*	Z_1
	Nominal Diameter at Equal Ends, *D*	Nominal Diameter at Reduced Ends, *d*		
(1)	(2)	(3)	(4)	(5)
xix)	160	125	420	119
xx)	160	110	420	113
xxi)	160	90	420	108
xxii)	160	75	420	99
xxiii)	160	63	420	92
xxiv)	180	160	460	133
xxv)	180	125	460	123
xxvi)	180	110	460	116
xxvii)	200	110	310	100
xxviii)	225	90	290	100
xxix)	225	110	310	100
xxx)	250	90	290	100
xxxi)	250	110	310	100
xxxii)	250	160	360	100
xxxiii)	280	90	290	100
xxxiv)	280	110	310	100
xxxv)	280	160	360	100
xxxvi)	315	90	290	100
xxxvii)	315	110	310	100
xxxviii)	315	160	360	100
xxxix)	355	90	370	100
xl)	355	110	390	100
xli)	355	160	440	100
xlii)	400	90	370	100
xliii)	400	110	390	100
xliv)	400	160	440	100
xlv)	450	90	370	100
xlvi)	450	110	390	100
xlvii)	450	160	440	100
xlviii)	500	90	370	100
xlix)	500	110	390	100
l)	500	160	440	100
li)	560	90	370	100

Table 7 (*Continued*)

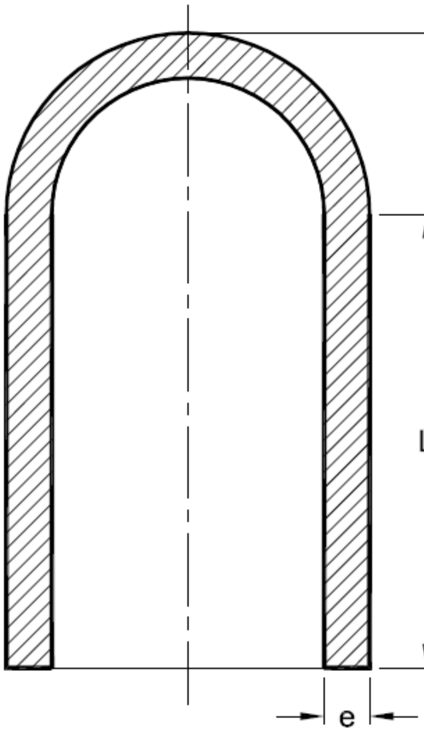
Sl No.	Size		Z	Z_1
	Nominal Diameter at Equal Ends, D	Nominal Diameter at Reduced Ends, d		
(1)	(2)	(3)	(4)	(5)
lii)	560	110	390	100
liii)	560	160	440	100
liv)	630	90	370	100
lv)	630	110	390	100
lvi)	630	160	440	100
lvii)	630	200	480	200
lviii)	710	90	490	100
lix)	710	110	510	100
lx)	710	160	560	100
lxi)	710	200	600	200
lxii)	800	90	490	100
lxiii)	800	110	510	100
lxiv)	800	160	560	100
lxv)	800	200	600	200
lxvi)	900	90	490	100
lxvii)	900	110	510	100
lxviii)	900	160	550	100
lxix)	900	200	550	150
lxx)	1 000	160	560	100
lxxi)	1 000	200	600	100
lxxii)	1 000	250	650	100
lxxiii)	1 000	280	680	200
lxxiv)	1 000	315	715	250
lxxv)	1 200	200	800	200
lxxvi)	1 200	250	850	200
lxxvii)	1 200	280	880	200
lxxviii)	1 200	315	915	250
lxxix)	1 200	400	1 000	300
lxxx)	1 600	200	800	200
lxxxi)	1 600	250	850	200
lxxxii)	1 600	280	880	200
lxxxiii)	1 600	315	915	250
lxxxiv)	1 600	400	1 000	300

Table 7 (*Conluded*)

Sl No.	**Size**		***Z***	***Z*₁**
	Nominal Diameter at Equal Ends, *D*	Nominal Diameter at Reduced Ends, *d*		
(1)	(2)	(3)	(4)	(5)
lxxxv)	1 600	500	1 100	300
lxxxvi)	2 000	1 200	2 400	500
lxxxvii)	2 250	1 000	2 700	570
lxxxviii)	2 500	1 400	3 000	600

Tolerances on various dimensions shall be as given below:

Dimension	*Tolerances*
Z	± 50 mm
Z_1	± 25 mm



NOTE — *e* is the wall thickness corresponding to IS 4984.

FIG. 8 INJECTION MOULDED END CAP

Table 8 Dimensions of Injection Moulded End Cap

(*Clause* 9.3.8.1)

All dimensions in millimetres.

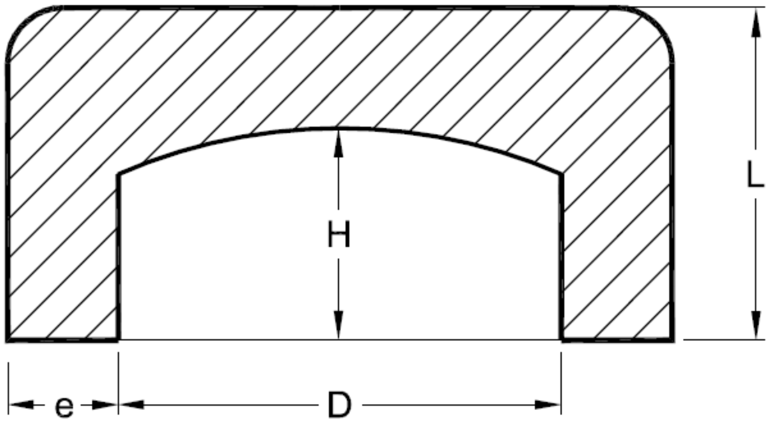
Sl No. (1)	Nominal Diameter, *D* (2)	Tubular Length, *L* (3)	Laying Length, *Z* (4)
i)	20	25	37
ii)	25	25	40
iii)	32	30	45
iv)	40	30	50
v)	50	30	55
vi)	63	40	65
vii)	75	45	75
viii)	90	55	90
ix)	110	60	100
x)	125	45	70
xi)	140	45	75
xii)	160	50	85

Table 8 (*Concluded*)

Sl No. (1)	**Nominal Diameter, *D*** (2)	**Tubular Length, *L*** (3)	**Laying Length, *Z*** (4)
xiii)	180	50	100
xiv)	200	60	110
xv)	225	60	115
xvi)	250	65	125

Tolerance on various dimensions shall be as given below:

Dimensions	*Tolerances*
Tubular length, L	± 2 mm
Laying length, Z	± 3 mm



NOTE — *e* is the wall thickness corresponding to IS 4984.

Fig. 9 Machine Moulded End Cap

Table 9 Dimensions of Machine Moulded End Cap

(*Clause* 9.3.8.2)

All dimensions in millimetres.

Sl No. (1)	**Size, *D*** (2)	**Depth, *H*** (3)	**Laying Length, *Z*** (4)
i)	20	7 ± 2	20 ± 5
ii)	25	7 ± 2	20 ± 5
iii)	32	7 ± 2	20 ± 5
iv)	40	7 ± 2	20 ± 5
v)	50	7 ± 2	20 ± 5
vi)	63	7 ± 2	20 ± 5
vii)	75	7 ± 2	20 ± 5
viii)	90	7 ± 2	20 ± 5

Table 9 (*Concluded*)

Sl No. (1)	**Size, *D*** (2)	**Depth, *H*** (3)	**Laying Length, *Z*** (4)
ix)	110	7 ± 2	20 ± 5
x)	125	20 ± 5	40 ± 8
xi)	140	20 ± 5	40 ± 8
xii)	160	20 ± 5	40 ± 8
xiii)	180	20 ± 5	40 ± 8
xiv)	200	20 ± 5	40 ± 8
xv)	225	30 ± 5	60 ± 8
xvi)	250	30 ± 5	60 ± 8
xvii)	280	30 ± 5	60 ± 8
xiii)	315	30 ± 5	60 ± 8
xix)	355	50 ± 5	80 ± 8
xx)	400	50 ± 5	80 ± 8
xxi)	450	50 ± 5	80 ± 8
xxii)	500	50 ± 5	80 ± 8
xxiii)	560	50 ± 5	80 ± 8
xxiv)	630	50 ± 5	80 ± 8
xxv)	710	50 ± 5	100 ± 10
xxvi)	800	50 ± 5	100 ± 10
xxvii)	900	50 ± 5	100 ± 10
xxviii)	1 000	100 ± 10	200 ± 10
xxix)	1 200	100 ± 10	200 ± 10
xxx)	1 400	100 ± 10	200 ± 10
xxxi)	1 600	100 ± 10	200 ± 10
xxxii)	1 800	140 ± 10	240 ± 10
xxxiii)	2 000	150 ± 10	250 ± 10
xxxiv)	2 250	150 ± 10	260 ± 10
xxxv)	2 500	150 ± 10	260 ± 10

10 PERFORMANCE REQUIREMENTS

10.1 Hydraulic Characteristics

10.1.1 A fitting (except sandwich flange) duly welded on all sides to straight length of a pipe of pressure rating to which the fitting corresponds, when subjected to internal pressure creep rupture testing in accordance with the procedure given in Annex E of IS 4984, and test assembly as given in Table 10, shall show no signs of localized swelling, leakage or weeping and shall not burst during the prescribed test duration. The temperature, duration of test and stresses for the test shall conform to the hydraulic characteristic requirements given in Table 11 according to the grade of material. Although the performance of welded joints is not the objective of this test, the joints shall be such that they are not the cause of the system failure. However, in case of failure of the weld, the test shall be repeated.

Table 10 Length of Pipe for Welding Test

(*Clause* 10.1.1)

All dimensions in millimetres.

Sl No.	Pipe Outside Diameter	Length of Pipe Section
(1)	(2)	(3)
i)	Up to 75	200
ii)	90 to 225	300
iii)	250 or more	500

10.1.2 *Sandwich Flange Hydraulic Testing*

Sandwich flange shall be tested as per **10.1.1** by slipping onto the pipe duly welded with pipe end as per standard practice.

10.2 Carbon Black Content and Dispersion

When tested from a composite sample of minimum three fittings, in accordance with IS 2530, the carbon black content shall be within 2.5 ± 0.5 percent. When tested from a composite sample of minimum three fittings, the carbon black dispersion shall meet the requirement of **5.4.6** of IS 7328.

10.3 Melt Flow Rate

When tested from a composite sample of minimum three fittings, as per IS 2530 at 190 °C with nominal load of 5 kgf, MFR of fitting shall not deviate from the MFR of the resin by more than 30 percent.

10.4 Density

When tested from a composite sample of minimum three fittings as per IS 7328, the base (corrected) density of fittings shall be between 940 kg/m^3 and 960 kg/m^3 and the same shall not differ from the density of the resin as specified by the resin manufacturer by more than 3 kg/m^3.

10.5 Oxidation Induction Time

The minimum oxidation induction time of the fitting when tested in accordance with Annex B of IS 4984 shall be not less than 20 min.

10.6 Overall Migration

When tested as per IS 9845, the overall migration of constituents of fitting shall be within the limits stipulated in IS 10146.

11 SAMPLING, FREQUENCY OF TESTS AND CRITERIA FOR CONFORMITY

11.1 Type Tests

11.1.1 Type tests are intended to prove the suitability and performance of a new composition, a new technique or a new size of a fitting. Even if no change is envisaged, type test shall be done at least once during the validity period as given for each of the type tests in **11.1.2.4**.

11.1.2 *Fittings Sizes up to 560 mm*

11.1.2.1 For overall migration test, three samples each of the smallest size of the fitting manufactured from each of the machines shall be selected at random from the regular production lot and tested for compliance as per Table 12. For all other type tests, three samples of fittings of same size, same grade, same SDR and same pressure rating shall be selected at random from the regular

Table 11 Hydraulic Characteristic Requirements of Injection Moulded/Machined Fittings

(*Clause* 10.1.1)

Sl No.	Test	Test Temperature °C	Test Duration h	Induced Hoop Stress MPa		
				PE 63	PE 80	PE 100
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Acceptance test:					
	a) For sizes ≥ 630 mm	27	1	2 × rated pressure	2 × rated pressure	2 × rated pressure
	b) For sizes < 630 mm	27	100	6.9	8.6	10.7
		80	48	3.8	4.9	5.7
ii)	Type test	80	165	3.5	4.5	5.4

production lot and shall be tested for compliance with the requirements of the type tests as given in Table 12.

Table 12 Type Tests

(*Clauses* 11.1.2.1 *and* 11.1.3)

Sl No.	Description of Test	Sample Size	Requirement Clause
(1)	(2)	(3)	(4)
i)	Internal pressure creep rupture test (hydrostatic resistance test) at 80 °C for 165 h	3	**10.1.1/10.1.2** (as applicable)
ii)	Oxidation induction time	3	**10.5**
iii)	Overall migration test	3	**10.6**

11.1.2.2 If all the samples pass the requirements of the type tests, the type of the fitting under consideration shall be considered eligible for type approval, which shall be normally valid for a period of two years. However, failure on the weld joint shall not be considered as a failure of the type test. In such a case, the test shall be repeated.

11.1.2.3 In case any sample fails in the type test, the testing authority, at its discretion, may call for fresh samples not exceeding the original number and subject them to the type test again. If in repeat test, no single failure occurs, the type of fitting under consideration shall be considered eligible for type approval. If any of the samples fails in the repeat tests, the type of fitting shall not be approved. The manufacturer or the supplier may be asked to improve the manufacturing process and resubmit the product for type approval.

11.1.2.4 At the end of the validity period (normally two years) or earlier as may be necessary, the testing authority may call for fresh samples for type test for the type approval.

11.1.3 *Fittings Sizes Including and Above 630 mm*

For fittings sizes 630 mm and above, the sampling and testing for type tests as given in Table 12 shall be as agreed between the purchaser and the manufacturer.

11.2 Acceptance Tests

11.2.1 Acceptance tests are carried out on samples selected from a lot for the purpose of acceptance of the lot.

11.2.2 *Lot*

All fittings of the same size, same SDR and same grade and also manufactured essentially under similar conditions of manufacture shall constitute a lot. For ascertaining conformity of the lot to the requirements of this standard, samples for acceptance tests shall be selected and tested for compliance as per Table 13. These fittings shall be selected at random from the lot and in order to ensure the randomness of selection, a random number table shall be used. For guidance and use of random number tables, IS 4905 may be referred. In the absence of a random number table, the following procedure may be adopted.

Starting from any fitting in the lot, count them as 1, 2, 3, 4, etc, up to r and so on, where r is the integral part of N/n, N being the number of fitting in the lot and n is the number of fittings in the sample. Every r^{th} fitting so counted shall be drawn so as to constitute the required sample size.

Table 13 Acceptance Tests

(*Clauses* 11.2.2 *and* 11.1.4)

Sl No.	Description of Test	Sample Size	Requirement Clause
(1)	(2)	(3)	(3)
i)	Visual and dimensional requirements	Table 14	**5, 8 and 9**
ii)	Internal pressure creep rupture test (hydrostatic resistance test) at 27 °C for 1 h/27 °C for 100 h and 80 °C for 48 h (as specified in Table 11)	Table 15	**10.1.1**
iii)	Carbon black content	Table 15	**10.2**
iv)	Carbon black dispersion	Table 15	**10.2**
v)	Melt flow rate	Table 15	**10.3**
vi)	Density	Table 15	**10.4**

11.2.3 *Visual and Dimensional Requirements for Fittings*

For ascertaining conformity of the lot to the requirements of this standard, the number samples shall be selected as per Table 14 in accordance with **11.1.2** and tested for compliance.

The number of fittings given for the first sample in col 4 of Table 14 shall be examined for dimensional and visual requirements given in **5**, **8** and **9**. Fittings failing to satisfy any of these requirements shall be considered as defective. The lot shall be deemed to have satisfied these requirements, if the number of defectives found in the first sample are less than or equal to the corresponding acceptance number given in col 6 of Table 14. The lot shall be deemed not to have met these requirements if the number of defectives found in the first sample is greater than or equal to the corresponding rejection number given in col 7 of Table 14. If, however, the number of defectives found in the first sample lies between the corresponding acceptance and rejection numbers given in col 6 and col 7 of Table 14 the second sample of the size given in col 4 of Table 14 shall be taken and examined for these requirements. The lot shall be considered to have satisfied these requirements, if the number of defectives found in the cumulative sample is less than or equal to the corresponding acceptance number given in col 6 of Table 14, otherwise not.

11.1.4 *Conformity to Acceptance Tests other than Dimensional and Visual Characteristics*

11.1.4.1 *Fittings sizes up to 560 mm*

The lot having satisfied visual and dimensional requirements shall be tested for acceptance tests other than dimensional and visual characteristics, that is, internal pressure creep rupture test (hydrostatic resistance test) at 80 °C for 48 h, MFR, density, carbon black content and carbon black dispersion as per Table 13. The number of samples to be selected and tested for each of the above tests shall be as per Table 15. The samples shall be selected randomly from the samples which have been already tested for and satisfied the requirements for visual and dimensional characteristics. The lot shall be considered to have met the requirements of these tests, if none of the samples tested fails.

Table 15 Scale of Sampling for Acceptance Tests Other than Visual and Dimensional Requirements

(*Clause* 11.1.4)

Sl No. (1)	No. of Pipes in the Lot (2)	Sample Size (3)
i)	Up to 150	3
ii)	151 to 1 200	5
iii)	1 201 to 35 000	8

11.1.4.2 *Fittings sizes including and above 630 mm*

For fittings sizes 630 mm and above, the scale of sampling and criteria of conformity shall be as agreed by the purchaser and the manufacturer.

12 MARKING

12.1 All fittings shall be clearly and indelibly marked at a prominent place in white/yellow colour using ink/paint or inkjet print or hot embossed at minimum one place, visible even after the installation of the fittings with the following information:

a) Manufacture's name/trade-mark;

b) Designation as per **6**;

c) Pressure rating;

d) Standard Dimension Ratio (SDR); and

e) Lot number/batch number, containing information of date of manufacture.

12.1.1 The lot number/batch number shall include the details of production in the following manner:

Year	Month	Day	Machine No.	Shift
xxxx	xx	xx	xxx	x

12.2 BIS Certification Marking

Injection moulded/machined PE fittings conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and each injection moulded/machined PE fitting may be marked with the Standard Mark.

Table 14 Scale of Sampling for Visual and Dimensional Requirements

(*Clause* 11.2.3)

Sl No. (1)	No. of Fittings in the Lot (2)	Sample Number (3)	Sample Size (4)	Cumulative Sample Size (5)	Acceptance Number (6)	Rejection Number (7)
i)	Up to 150	First	13	13	0	2
		Second	13	26	1	2
ii)	151 to 280	First	20	20	0	3
		Second	20	40	3	4
iii)	281 to 500	First	32	32	1	4
		Second	32	64	4	5
iv)	501 to 1 200	First	50	50	2	5
		Second	50	100	6	7
v)	1 201 to 3 200	First	80	80	3	7
		Second	80	160	8	9
vi)	3 201 to 10 000	First	125	125	5	9
		Second	125	250	12	13
v)	10 001 to 35 000	First	200	200	7	11
		Second	200	400	18	19

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Plastic Piping System Sectional Committee, CED 50

Organization	*Representative(s)*
Central Institute of Plastic Engineering and Technology, Chennai	Dr S. K. Nayak (***Chairman***)
Borouge India Pvt Ltd, Mumbai	Shri Prashant D. Nikhade
Brihan Mumbai Licensed Plumbers Association, Mumbai	Shri Kishor V. Merchant Shri Bijal M. Shah (*Alternate*)
Central Institute of Plastic Engineering and Technology, Chennai	Dr S. N. Yadav Shri D. Anjaneya Sharma (*Alternate*)
Central Public Health Environmental Engineering Organization, New Delhi	Adviser (PHE) Assistant Adviser (PHE) (*Alternate*)
Central Public Works Department, New Delhi	Shri M. K. Sharma Shri Amar Singh (*Alternate*)
Chennai Metropolitan Water Supply & Sewerage Board, Chennai	Engineering Director Superintending Engineer (P & D) (*Alternate*)
CSIR-Central Building Research Institute, Roorkee	Dr B. Singh Shri Rajiv Kumar (*Alternate*)
CSIR-National Environmental Engineering Research Institute, Nagpur	Dr (Shrimati) Abha Sargonkar Dr Ritesh Vijay (*Alternate*)
Delhi Development Authority, New Delhi	Superintending Engineer (D) Executive Engineer (R & D) (*Alternate*)
Delhi Jal Board, New Delhi	Shri Y. K. Sharma Shri S. L. Meena (*Alternate*)
Department of Chemical & Petrochemicals Govt of India, New Delhi	Joint Industrial Advisor
Finolex Industries Limited, Pune	Shri Arun Sonawane Shri D. J. Salunke (*Alternate*)
GAIL India Limited, New Delhi	Shri Manish Khandelwal Shri Kuldeep Negi (*Alternate*)
Government e-Marketplace, New Delhi	Representative
Haldia Petrochemicals Ltd, Kolkata	Shri Raj K. Datta Shri Amartya Maity (*Alternate*)
Indian Oil Corporation Ltd, Panipat	Shri Dhananjay Sahoo Shri Raja Poddar (*Alternate*)
Jain Irrigation System Limited, Jalgaon	Shri S. Narayanaswami Shri P. H. Chaudhari (*Alternate*)
Kolkata Municipal Corporation, Kolkata	Shri D. K. Sanyal Shri A. K. Biswas (*Alternate*)
Mahindra EPC Irrigation Ltd, Nashik	Shri Sankar Kumar Maiti Shri C. V. Joshi (*Alternate*)

Organization	*Representative(s)*
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of MoD (Army), New Delhi	SHRI A. K. DUBEY SHRI R. K. CHAUHAN (*Alternate*)
Ministry of Drinking Water and Sanitation, New Delhi	SHRI DINESH CHAND SHRI SUMIT PRIYADARSHI (*Alternate*)
NSF Safety and Certification India PvtLtd, Gurugram	SHRI B. B. SINGH SHRI NASRIN KASHEFI (*Alternate*)
Odisha PVC Pipes Manufacturing Association, Bhubaneswar	SHRI NIKUNJ CHHOTRAY
Panchayati Raj and Drinking Water Department, Govt of Odisha, Bhubaneswar	CHIEF ENGINEER
Plastindia Foundation, Mumbai	SHRI RAJIV J. RAVAL DR E. SUNDARESAN (*Alternate*)
Public Health Engineering Department, Jaipur	SUPERINTENDING ENGINEER EXECUTIVE ENGINEER (*Alternate*)
Reliance Industries Limited, Mumbai	SHRI S. V. RAJU SHRI SAURABH BAGHAL (*Alternate*)
RITES Limited, New Delhi	SHRI PANKAJ AGGARWAL SHRI MUKESH SINHA (*Alternate*)
Shaktiman Extrusions Pvt Ltd, Perumbavoor	SHRI N. SURESH SHRI T. S. MANOJ (*Alternate*)
Supreme Industries Limited, Jalgaon	SHRI G. K. SAXENA
Tamil Nadu Water Supply & Drainage Board, Chennai	ENGINEERING DIRECTOR JOINT CHIEF ENGINEER (COM) (*Alternate*)
In Personal Capacity (*A-59, Sector 35, Noida 201 301*)	SHRI KANWAR A. SINGH
In Personal Capacity (*L-202 Metrozone, Anna Nagar West Chennai 600 040*)	SHRI G. K. SRINIVASAN
BIS Directorate General	SHRI SANJAY PANT, SCIENTIST 'F' AND HEAD (CED) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary

SHRIMATI MADHURIMA MADHAV
SCIENTIST 'D' (CIVIL ENGINEERING), BIS

Polyolefins and GRP Piping System Subcommittee, CED 50 : 1

Organization	*Representative(s)*
In Personal Capacity (*A-59, Sector 35, Noida 201 301*)	Shri Kanwar A. Singh (***Convener***)
Alom Poly Extrusion Ltd, Kolkata	Shri Arnav Jhunjhunwala Shri Anik Kumar Chowdhury (*Alternate*)
Assam Gas Company Limited, Dibrugarh	Shri Surjaya Tamulik Shri Ahijit Baruah (*Alternate*)
Bhimrajka Impex Limited, Mumbai	Shri Vinod Bhimrajka
Central Ground Water Board, Faridabad	Shri D. N. Arun Shri K. R. Biswas (*Alternate*)
Central Institute of Plastics Engineering and Technology, Chennai	Dr K. Prakalathan Dr A. K. Mohapatra (*Alternate*)
Central Public Works Department, New Delhi	Shri M. K. Sharma (CSQ) Shri Amar Singh (*Alternate*)
CSIR-National Environmental Engineering Research Institute, Nagpur	Dr (Shrmati) Abha Sargaonkar Dr Ritesh Vijay (*Alternate*)
Chennai Water Supply & Sewerage Board, Chennai	Engineering Director Chief Engineer (O & M) (*Alternate*)
Delhi Jal Board, New Delhi	Shri Y. K. Sharma Shri S. L. Meena (*Alternate*)
Duraline India Pvt Ltd, Mumbai	Shri Rajeev Chaturvedi Shri Sunil Saxena (*Alternate*)
Engineers India Ltd, New Delhi	Shri N. Kaul Shri R. B. Bhutda (*Alternate*)
EPP Composite Pipes, Rajkot	Shri Jayraj Shah Shrimati Seema Vaidya (*Alternate*)
GAIL India Limited, New Delhi	Dr Debasish Roy Shri Manish Khandelwal (*Alternate*)
Godavari Polymers Pvt Limited, Secunderabad	Shri C. Venkateshwar Rao Shri G. Sridhar Rao (*Alternate*)
Government E-Marketplace, New Delhi	Representative
Indraprastha Gas Limited, New Delhi	Representative
Industrial Toxicology Research Centre, Lucknow	Dr V. P. Sharma Dr Virendra Misra (*Alternate*)
Jain Irrigation Systems Limited, Jalgaon	Shri M. R. Kharul Shri M. D. Chaudhari (*Alternate*)
Kimplas Piping Systems Ltd, Nashik	Shri Kiran Sarode Shri Santosh Kumar (*Alternate*)
KITEC Industries India Limited, Mumbai	Shri Dalip V. Kolhe Shri Manoranjan G. Choudhary (*Alternate*)
Mahanagar Gas Limited, Mumbai	Shri K. Venugopal Shrimati Neha Kharya (*Alternate*)
Mahanagar Telephone Nigam Limited, New Delhi	Chief Engineer (BW)

Organization	*Representative(s)*
Maruthi Tubes Pvt Ltd, Secunderabad	Shri Manchaala Raghavendra Shri M. Nagesh Kumar (*Alternate*)
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of MoD (Army), New Delhi	Shri A. K. Dubey Shri R. K. Chauhan (*Alternate*)
National Test House, Kolkata	Shri S. P. Kalia Shri M. M. Pabalkar (*Alternate*)
Ori-Plast Limited, Kolkata	Shri Ashish Agarwal Shri Somnath Mukherjee (*Alternate*)
Public Health & Municipal Engineering Department, Hyderabad	Shri K. Suresh Kumar Shri Ch. Mallikarjunudu (*Alternate*)
Reliance Industries Limited, Mumbai	Shri S. V. Raju Shri Saurabh Baghal (*Alternate* I) Shri Tushar Dongre (*Alternate* II)
In Personal Capacity (*H-23/01, Panchjyot Society, Sector 29, Vashi, Navi Mumbai, 400 703*)	Shri V. K. Sharma

Panel for Revision of IS 4984 and IS 14333, CED 50 : P2

Organization	*Representative(s)*
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Borouge (India) Pvt Ltd, Mumbai	Shri Prashant D. Nikhade
Central Institute of Plastics Enggineering and Technology, Chennai	Shri M. Navaneethan
Duraline India Pvt Ltd, Mumbai	Shri Rajeev Chaturvedi Shri Sunil Saxena (*Alternate*)
Godavari Polymers Pvt Ltd, Secunderabad	Shri C. Venkateshwar Rao
Haldia Petrochemicals Ltd, Kolkata	Shri Raj K. Datta Shri T. R. Srikanth (*Alternate*)
Jain Irrigation Systems Limited, Jalgaon	Shri M. R. Kharul
Reliance Industries, Mumbai	Shri S. V. Raju Shri Tushar Dongre (*Alternate*)
Supreme Industries Ltd, Jalgaon	Shri G. K. Saxena
In Personal Capacity (*H-23/01, Panchjyot Society, Sector 29, Vashi, Navi Mumbai, 400 703*)	Shri V. K. Sharma

(*Continued from second cover*)

f) 90° bends of sizes from 20 mm to 160 mm were covered, which have been now increased to 315 mm;

g) 90° tees of sizes from 20 mm to 160 mm were covered, which have been now increased to 315 mm;

h) Injection moulded reducers of sizes from 20 mm to 315 mm and machined reducers of sizes from 20 mm to 630 mm were covered. Only machined reducers of sizes 355 mm and above were covered which had to be manufactured from machining process from thick walled extruded pipes or compression moulded slabs. The dimensional requirements were also different for injection moulded and machined reducers. In this revision, considering the advancements in the manufacturing of reducers which has resulted in similar quality and finish of the fittings from both machining and moulding process, the dimensional requirements for both the types of reducers of sizes 20 mm to 1 400 mm have been covered together;

j) Tolerances on various dimensions of ferrule reducers have now been specified;

k) Pipe ends of sizes from 20 mm to 1 000 mm were covered, which have been now increased to cover sizes up to 2 500 mm;

m) Sandwich flanges of sizes from 15 mm to 600 mm were covered, which have been now increased to cover sizes from 16 mm to 2 000 mm;

n) Illustrative figure for reducing tees has been modified;

p) Reducing tees of sizes 90 to 140 mm were covered, which has been now changed to cover sizes from 63 to 2 500 mm; and

q) Moulded/machined end caps of sizes 20 to 250 mm were covered having similar requirements. In this revision, moulded end caps and machined end caps have been covered separately with different requirements of depth and laying length. Moulded end caps of sizes 20 to 250 mm are covered and machined end caps of sizes 20 to 2 500 mm have been covered.

Fittings from 20 mm to 315 mm are generally manufactured by the injection moulding methods and machined, wherever so required; and fittings of 355 mm and above are manufactured from thick walled extruded pipes or compression moulded slabs or extrusion flow moulding and then machined to desired dimensions.

Provisions have been made for rewelding, in case any weld gets rejected. Weld length had been kept constant with a uniform tolerance.

In respect of potential adverse effects caused by these fittings on the quality of water intended for human consumption, this standard provides no information as to whether the fittings may be used without any restrictions and applicable regulations (if any) concerning the use of these fittings are to be followed.

The composition of the technical committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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